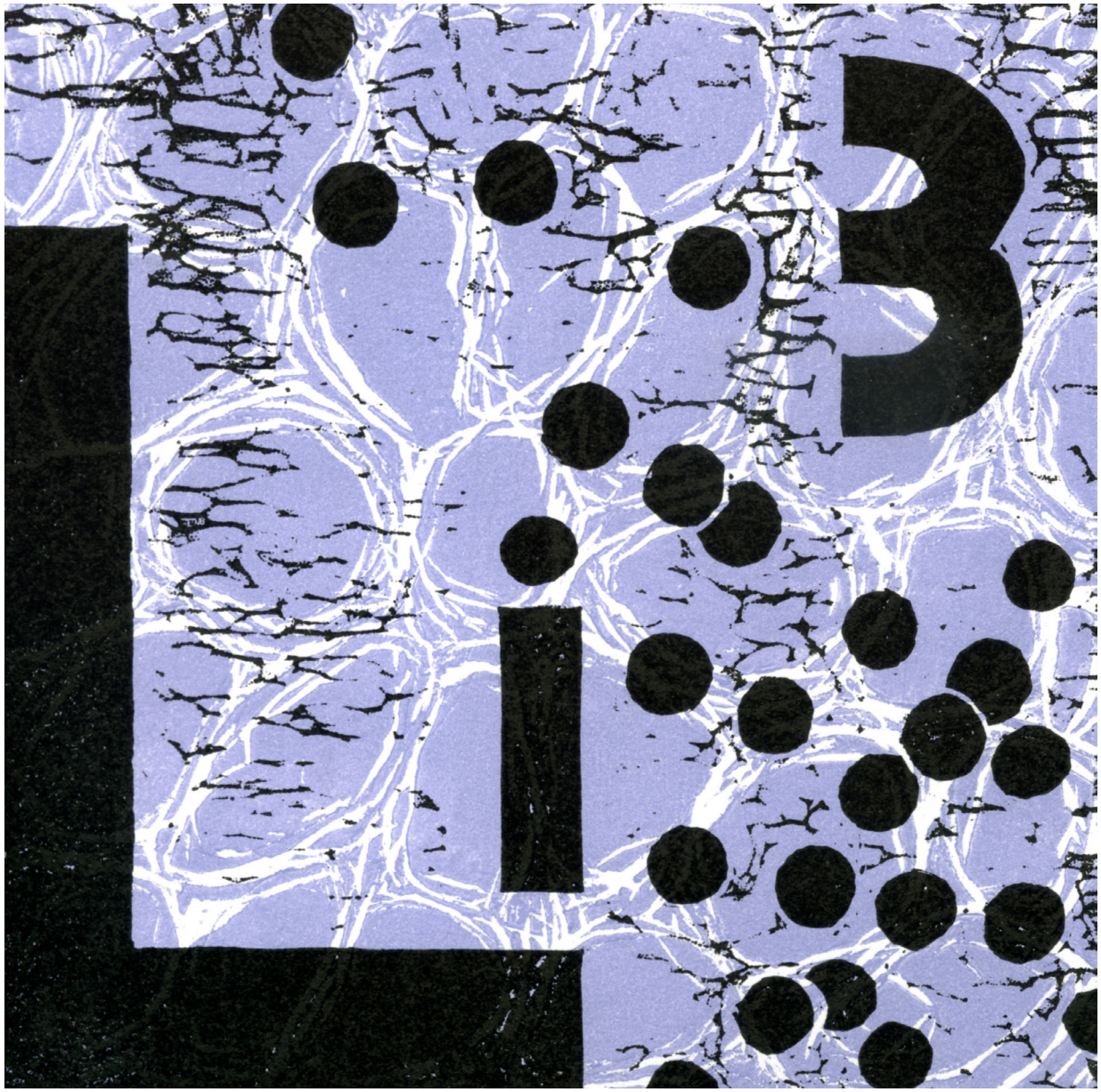

SARAH ROBERT-TISSOT

LITHIUM

Element Symbol: Li
Atomic Number: 3

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The discovery of lithium dates to 1817 when the Swedish chemist Johan August Arfwedson (1792-1841) detected a new element that comprised around 10% of the mineral petalite ($LiAlSi_4O_{10}$). Petalite had been discovered in Scandinavia in 1800 by the Brazilian chemist José Bonifácio de Andrada e Silva (1763-1838). Lithium is named after the Greek word lithos meaning stone, stemming from its origin of discovery.

Lithium is not found naturally in its elemental form due to its high reactivity as an alkali metal. Lithium was first isolated in its elemental, metallic, within a few years of its discovery by the Swedish chemist William Thomas Brande (1788-1866) and English chemist Sir Humphry Davy (1778-1829) using electrolysis methods. Electrolysis remains the modern commercial method for lithium metal production, with the various lithium salt sources being first converted to lithium chloride.

Lithium is a relatively common element in the Earth's crust. Its estimated abundance of 0.005% makes it the 25th most common element. As well as having a range of mineral sources, lithium can also be obtained from the evaporation of sea water (0.14 to 0.25 ppm) as lithium chloride. South America has the largest reserves of lithium, with large producers including Bolivia, Chile and Argentina. The US, Australia and Chile are also major suppliers.

Lithium has two relatively abundant natural isotopes, ^{6}Li and ^{7}Li. A number of radioisotopes have been produced that all have half-lives of less than one second. The atomic weight of lithium makes it the lightest metal, in fact the lightest of all non-gaseous elements.

Lithium is found in trace amounts in many organisms, with levels being lower in vertebrates. Bioaccumulation is greater in marine organisms compared to terrestrial organisms. The physiological role of natural levels of lithium in all organisms is generally not well known. However, the use of lithium salts in the treatment of bipolar disorder is well established. The early research into this application was undertaken by the Australian Dr John Cade in the post World War II period. His discovery was serendipitous, having been accidently discovered when experimentally investigating the possible link between uric acid and mania that involved treating guinea pigs using lithium urate due to its high solubility. The guinea pigs were found to have a calming effect, in contrast to his anticipated opposite outcome. Following this, lithium treatment became the first effective treatment for any mental illness, though significant delays occurred before wide implementation.

Lithium is used in both lithium batteries and lithium-ion batteries. The latter application is increasing rapidly as the need for improved rechargeable batteries for portable electronic devices is becoming ever more demanding. Lithium based technologies offer advantages in terms of the voltage of the cell, approximately 3 V due to the high electrochemical potential of lithium, and the high power-to weight ratio of the batteries owing to the low atomic weight of lithium.

Chemical and industrial uses of lithium include the use of organolithium reagents as strong bases and reagents for C-C bond formation in pharmaceutical and fine-chemical industry, and as catalysts/initiators for alkene polymerisation. Still is strong basic behaviour in lithium hydroxide, which can be used to produce lithium soaps that can thicken oils, which sees its usage in high temperature lubricants.

Provided by the element sponsor Michael Gardiner

ARTISTS DESCRIPTION

The background is taken from a photograph of the crystal-like formations found in the Atacama Desert, Chile, where the raw state of lithium is produced/formed.

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